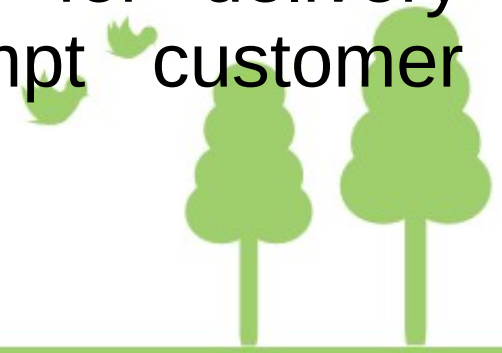
Calculating optimum location for Courier distribution depot

Problem details

Company X, one of the largest international courier, package delivery and express mail service entity is looking for a tool to revamp geographical distribution of their delivery depots.

The goal of the proposed solution is to, analyze the important landmark distributions of different cities and propose suitable geographical locations for delivery depots to facilitate efficient and prompt customer service.



Data-set

A list of cities where the company is currently operating or may open operation in near future.

Sample Data:

City	Lat	Lng	Country	Capital	Population
Tokyo	35.6897	139.6922	Japan	primary	37977000
Jakarta	-6.2146	106.8451	Indonesia	primary	34540000
Delhi	28.66	77.23	India	admin	29617000
Mumbai	18.9667	72.8333	India	admin	23355000
Manila	14.5958	120.9772	Philippines	primary	23088000

Methodology

To address the subject requirement, ***Foursquare location data service(FLDS)*** is be used. More specifically:

venues/categories : Returns a hierarchical list of categories applied to venues.

venues/search: Returns a list of venues near the current location, optionally matching a search term.

Above apis are be used. Using *venues/categories* api we got all the venue category details used by FLDS. Each venue category also contains sub categories.

Using *venues/search* api along with target *city lat/lng* data and top level venue *categoryId*s we fetched all target venues in the vicinity of any target city.

Methodology cont..

After that, applying ***k-means clustering*** algorithm on venue location data and varying cluster size we got the suitable delivery depot latitude & longitude from the kmeans cluster centers.

Finally, to get the actual physical address of the proposed delivery depots given by ***k-means clustering*** reverse Geo-coding service of https://revgeocode.search.hereapi.com *api was used.*

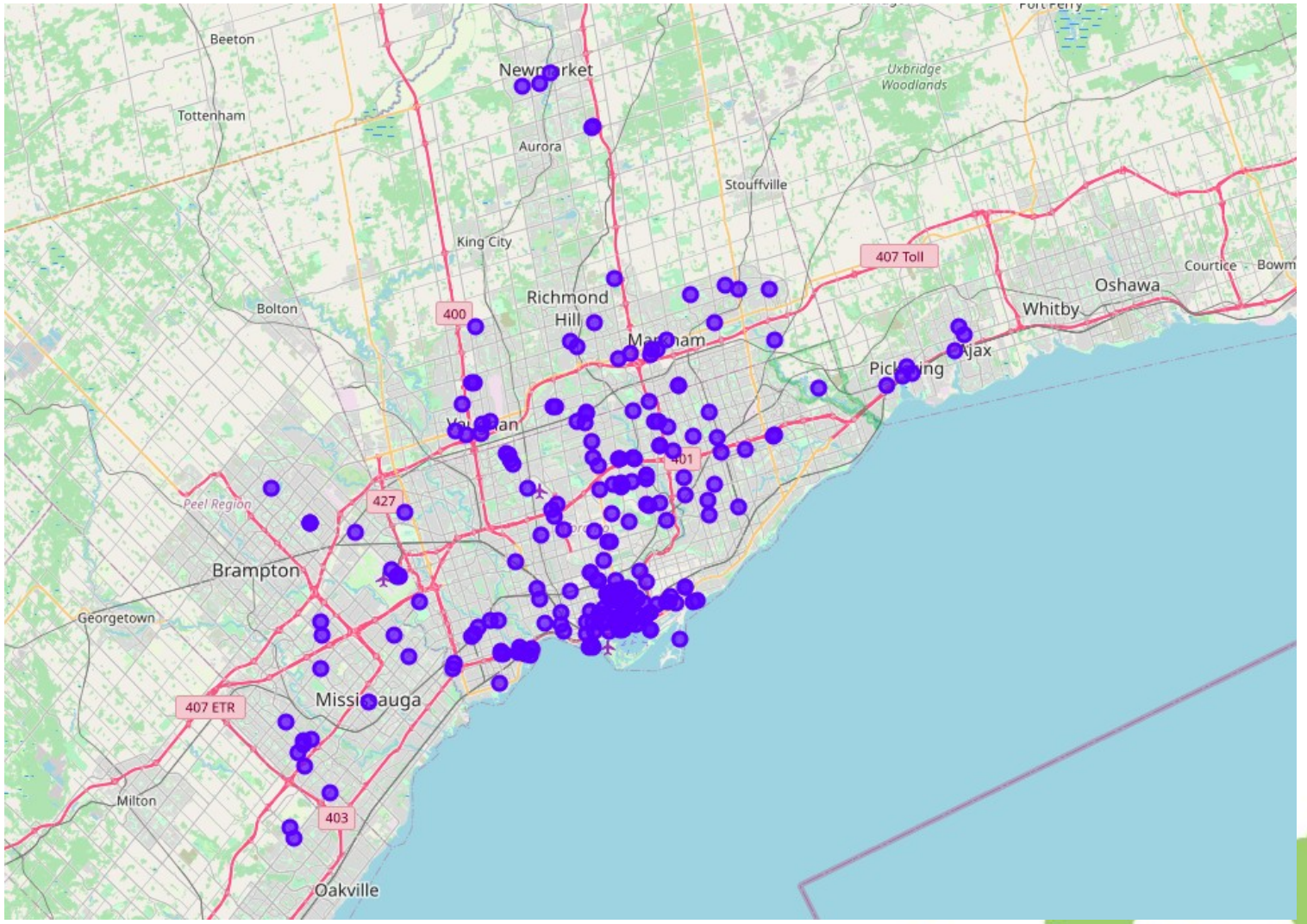
To plot the venues and proposed depot location ***folium*** library is used.

Analysis result for “Toronto” city

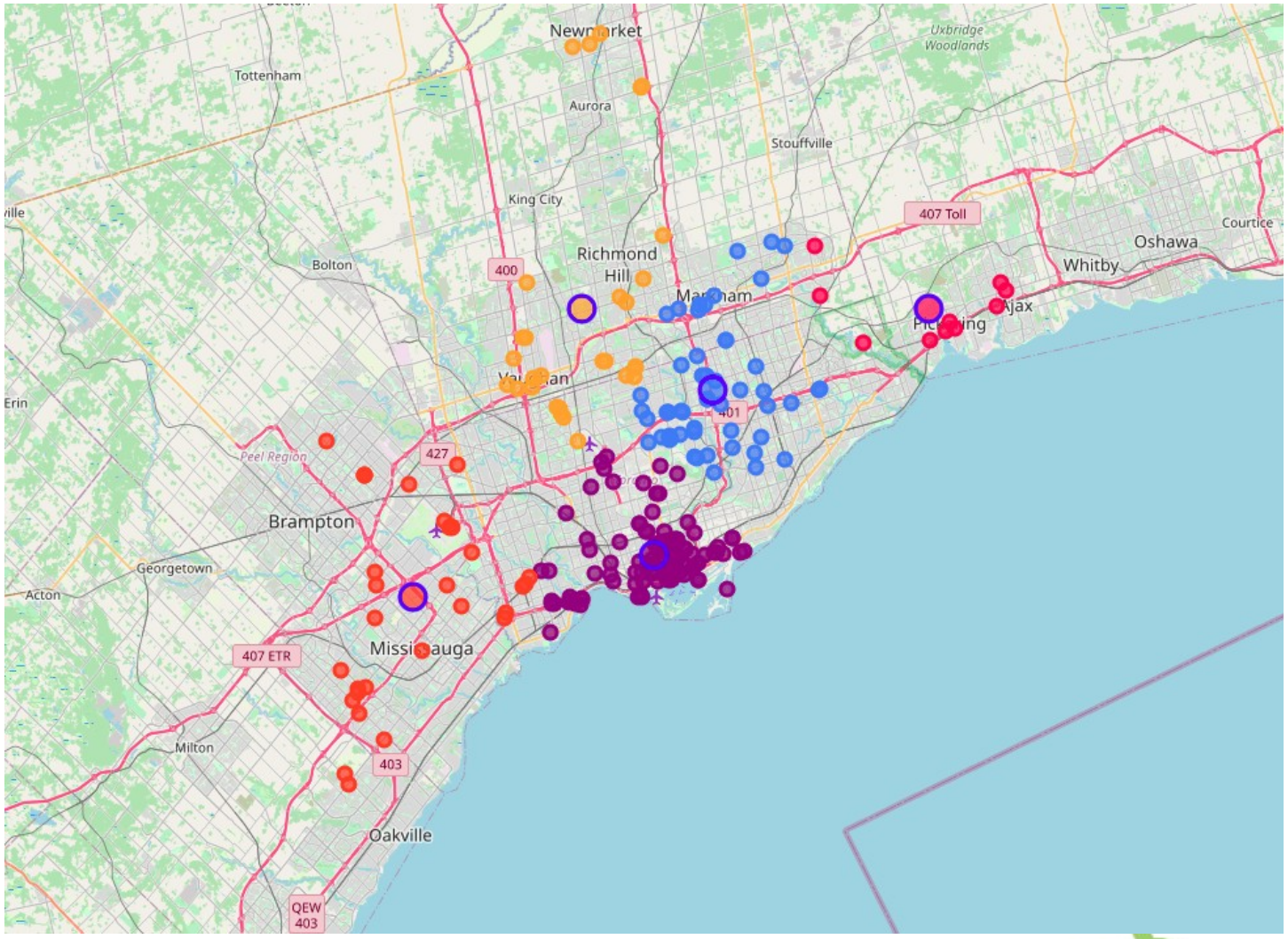
Few rows of “Venues” data-frame:

Name	Lat	Lng	Address
Toronto Botanical Garden	43.7341044008271	-79.3583214626127	777 Lawrence Avenue East (Leslie St.),Toronto ON M3C 1P2,Canada
Mrs. Claus' Sweatshop	43.7538004766528	-79.3195817417173	Cassandra Blvd. (at Mar's Toad Lillypad),Toronto ON,Canada
Maja Prentice Theatre	43.6213813390079	-79.602809300749	Burnhamthorpe And Dixie,Mississauga ON,Canada
Downsview Park	43.7458665613212	-79.4804541387687	35 Carl Hall Rd.,Toronto ON M3K 2B6,Canada
Ashbridge's Bay Park	43.6618219590429	-79.3104239962397	Ashbridge's Bay Park Rd.,Toronto ON M4M 1B4,Canada

All venues of “Toronto” city



Venues with depot location for “Toronto” city



Suggested depot location for Toronto City

Latitude	Longitude	Address
43.84	-79.14	RR-27, Pickering, ON L1V, Canada
43.66	-79.4	570 Spadina Ave, Toronto, ON M5S 2H2, Canada
43.63	-79.65	LG Electronics Canada (Goldstar), 550 Matheson Blvd E, Mississauga, ON L4Z, Canada
43.78	-79.35	3000 Don Mills Rd E, Toronto, ON M2J 3B6, Canada
43.85	-79.48	150 Upper Post Rd, Vaughan, ON L6A 4J9, Canada

Using similar method, optimum location for delivery location can be calculated for any city of subject city data-frame.

Moreover, using mentioned tools and procedures, optimum distribution points for any other business venture can be calculated.

Thank you...